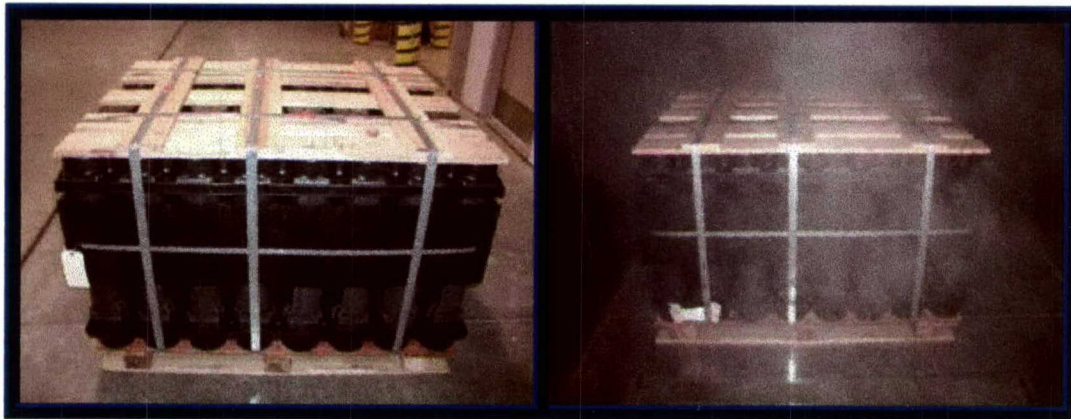


**FINAL REPORT  
AUGUST 2005**

**REPORT NO. 05-19A**



**COMPOSITE MONOPACK FOR 120MM MORTAR,  
WITH PLASTIC PALLET ADAPTERS ON A 42" x 53" WOODEN PALLET,  
MIL-STD-1660 TESTS, "DESIGN CRITERIA FOR AMMUNITION UNIT  
LOADS", AND EXTREME TEMPERATURE TESTS**

Prepared for:

Distribution Unlimited

Commander  
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Picatinny, NJ 07806-5000



**DEFENSE AMMUNITION CENTER  
VALIDATION ENGINEERING DIVISION  
MCALESTER, OKLAHOMA 74501-9053**

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AUGUST 2005

**COMPOSITE MONOPACK FOR 120MM MORTAR,  
WITH PLASTIC PALLET ADAPTERS ON A 42" x 53" WOODEN PALLET,  
MIL-STD-1660 TESTS, "DESIGN CRITERIA FOR AMMUNITION UNIT  
LOADS" AND EXTREME TEMPERATURE TESTS**

**ABSTRACT**

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV) was tasked by US Army ARDEC (AMSRD-AAR-AIL-P) to conduct MIL-STD-1660 Tests to determine if the composite monopack for the 120MM mortar, with plastic pallet adapters on a 42" x 53" wooden pallet, designed by US Army ARDEC and manufactured by Vantage Plastics, could be utilized for the unitization and transportation of the 120MM mortar. The test units were tested in accordance with the procedures set forth in MIL-STD-1660. Stacking, repetitive shock, edgewise-rotational drop, incline-impact, forklifting, and disassembly testing were conducted on the test units. The test units were also tested at extreme temperature conditions that could be encountered in the life cycle of the pallet. The extreme temperature tests conducted on the test units at -40 Degrees Fahrenheit and 135 degrees Fahrenheit were the repetitive shock, edgewise-rotational drop, and incline-impact.

The test units passed the requirements of the MIL-STD-1660 and the extreme temperature tests. The composite monopack, 120MM mortar, with plastic pallet adapters on a 42" x 53" wooden pallet can be utilized by the U.S. Army.

Prepared by:



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**U.S. ARMY DEFENSE AMMUNITION CENTER  
VALIDATION ENGINEERING DIVISION  
MCALESTER, OK 74501-9053**

**REPORT NO. 05-19A**

**COMPOSITE MONOPACK FOR 120MM MORTAR,  
WITH PLASTIC PALLET ADAPTERS ON A 42" x 53" WOODEN PALLET,  
MIL-STD-1660 TESTS, "DESIGN CRITERIA FOR AMMUNITION UNIT  
LOADS" AND EXTREME TEMPERATURE TESTS**

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## **PART 1 – INTRODUCTION**

**A. BACKGROUND.** The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV) was tasked by US Army ARDEC (AMSRD-AAR-AIL-P) to conduct MIL-STD-1660 Tests to determine if the composite monopack for the 120MM mortar, with plastic pallet adapters on a 42" x 53" wooden pallet, designed by US Army ARDEC and manufactured by Vantage Plastics, could be utilized for the unitization and transportation of the 120MM mortar. The test units were tested in accordance with the procedures set forth in MIL-STD-1660. Stacking, repetitive shock, edgewise-rotational drop, incline- impact, forklifting and disassembly testing were conducted on the test units. The test units were also tested at extreme temperature conditions that could be encountered in the life cycle of the pallet. The extreme temperature tests conducted on the test units at –40 Degrees Fahrenheit and 135 degrees Fahrenheit, were the repetitive shock, edgewise-rotational drop, and incline-impact. The unitization procedures were provided by DAC, Transportation Engineering Division (SJMAC-DET) (See Part 6).

**B. AUTHORITY.** This test was conducted IAW mission responsibilities delegated by the U.S. Army Joint Munitions Command (JMC), Rock Island, IL. Reference is made to the following:

1. AR 740-1, 15 June 2001, Storage and Supply Activity Operation
2. OSC-R, 10-23, Mission and Major Functions of U.S. Army Defense Ammunition Center (DAC) 21 Nov 2000.

**C. OBJECTIVE.** The objective of the testing was to determine if the composite monopack for 120MM mortar, with plastic pallet adapters on a 42" x 53" wooden pallet could be used for unitization of 120MM mortars and could successfully pass MIL-STD-1660 test requirements. Also, the extreme temperature tests

were conducted to see if the pallet could withstand extreme temperature conditions that could occur during the life cycle of the pallet.

**D. CONCLUSION.** The test units passed the requirements of the MIL-STD-1660 and the extreme temperature tests. The composite monopack, 120MM mortar, with plastic pallet adapters on a 42" x 53" wooden pallet can be utilized by the U.S. Army.

## **PART 2 - ATTENDEES**

### **ATTENDEE**

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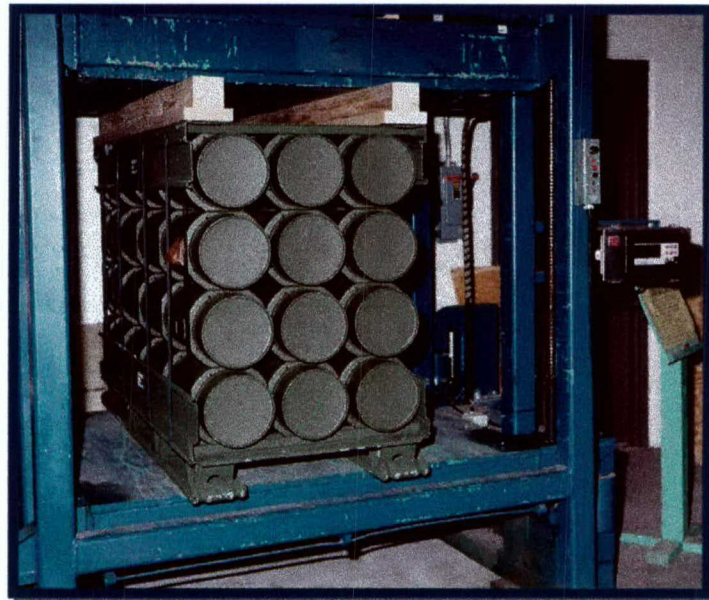
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## **PART 3 - TEST PROCEDURES**

**A. MIL-STD-1660 TEST.** The test procedures outlined in this section from were extracted from the MIL-STD-1660. The tests are conducted on ammunition pallet units or unit loads and are summarized as follows:

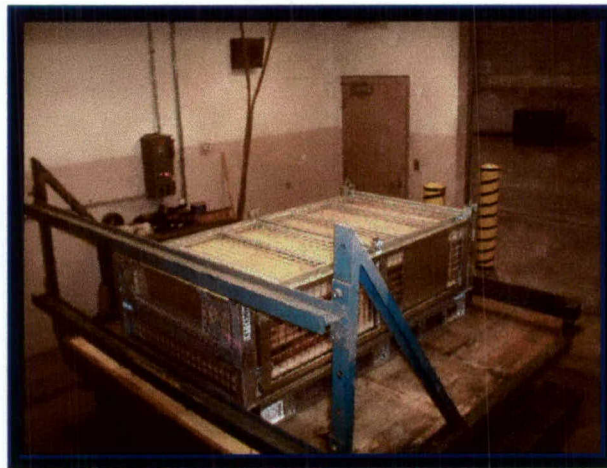
**1. STACKING TEST.** The test unit will be tested to simulate a stack of identical items stacked 16 feet high, for a period of one hour. This stacking load will be simulated by subjecting the specimen to a compression weight equal to an equivalent 16-foot stacking height. Photo 1 below shows an example of a unit load in the compression tester.



**Photo 1. Example of Stacking Test.**  
**(2.75-inch Hydra 70, PA151 Rocket Pallet in the Stacking Test.)**

**2. REPETITIVE SHOCK TEST.** The repetitive shock test is conducted IAW Method 5019, Federal Standard 101. The test procedure is as follows: The test unit will be placed on (not fastened to) the platform. With the test unit in one position, the platform will be vibrated at ½-inch amplitude

(1-inch double amplitude) starting at a frequency of approximately 3 cycles-per-second. The frequency will be steadily increased until the specimen leaves the platform. The resonant frequency is achieved when a 1/16-inch-thick feeler gage momentarily slides freely between every point on the specimen in contact with the platform at some instance during the cycle. Midway into the testing period, the specimen will be rotated 90 degrees, and the test continued for the duration. Unless failure occurs, the total time of vibration will be three hours. Photo 2 shows an example of the repetitive shock test.



**Photo 2. Example of the Repetitive Shock Test.  
(MSTF Low)**

**3. EDGEWISE ROTATIONAL DROP TEST.** This test is conducted using the procedures of Method 5008, Federal Standard 101. The procedure for the edgewise rotational drop test is as follows: The test unit will be placed on its skids with one end of the pallet supported on a beam 6 inches high. The height of the beam will be increased as necessary to ensure that there is no support for the skids between the ends of the specimen when the dropping takes place, but should not be high enough to cause the specimen to slide on the supports when the dropped end is raised for the drop. The unsupported end of the specimen is then raised and allowed to fall freely to the concrete, pavement, or similar



unyielding surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection will conform to the following tabulation:

GROSS WEIGHT (WITHIN RANGE LIMITS) (Pounds)	DIMENSIONS OF ANY EDGE, HEIGHT OR WIDTH (WITHIN RANGE LIMITS) (Inches)	HEIGHT OF DROPS ON EDGES	
		Level A (Inches)	Level B (Inches)
150-250	60-66	36	27
250-400	66-72	32	24
400-600	72-80	28	21
600-1,000	80-95	24	18
1,000-1,500	95-114	20	16
1,500-2,000	114-144	17	14
2,000-3,000	Above 145- No limited	15	12
Above – 3,000		12	9

Figure 1.



Photo 3. Example of Edgewise Rotational Drop Test  
(MSTF Low)



**4. INCLINE-IMPACT TEST.** This test is conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the incline-impact test is as follows: The test unit will be placed on the carriage with the surface or edge to be impacted projecting at least 2 inches beyond the front end of the carriage. The carriage will be brought to a predetermined position on the incline and released. If it were desired to concentrate the impact on any particular position on the container, a 4- x 4-inch timber may be attached to the bumper in the desired position before the test. The carriage will not strike any part of the timber. The position of the specimen on the carriage and the sequence in which surfaces and edges are subjected to impacts may be at the option of the testing activity and dependent upon the objective of the test. When the test is to determine satisfactory requirements for a container or pack, and, unless otherwise specified, the specimen will be subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at the time of the impact will be 7 feet-per-second. Photo 4 shows an example of this test.



**Photo 4. Example of the Incline-Impact Test.**  
**(2.75-Inch, Hydra 70, PA151 Rocket Pallet on incline-impact tester.)**

5. **SLING COMPATIBILITY TEST.** The test unit utilizing special design or non-standard pallets will be lifted, swung, lowered and otherwise handled as necessary, using slings of the types normally used for handling the unit loads under consideration. Slings will be easily attached and removed. Danger of slippage or disengagement when load is suspended will be cause for rejection of the specimen.

6. **FORKLIFTING TESTS.** The test unit will be lifted clear of the ground by a forklift from the end of the test unit and transported on the forks in the level or back-tilt position. The forklift will pass over the Optional Rough Handling Course For Forklift Trucks as outlined in MIL-STD-1660. The course will consist of parallel pairs of 1-inch boards spaced 54 inches apart and will be laid flat wise on the pavement across the path of the forklift. One pair will be laid at an angle of approximately 60 degrees to the path so that the left wheel strikes first. Another pair will be laid securely across the path of the forklift so that the wheels strike simultaneously. Another pair will be laid at an angle of approximately 75 degrees to the path so that the right wheel strikes first. The test unit will be transported over the Optional Rough Handling Course. The test unit shall be observed for deflection and damage. The test unit will be rotated 90 degrees and the test unit lifted from the side and the above steps repeated.

7. **DISASSEMBLY TEST.** Following all rough handling tests the test unit may be squared up within 2 inches of its original shape and on a flat level surface. The strapping will then be cut and removed from the palletized load. Assembly of the test unit will be such that it retains its unity upon removal of the strapping.



## **B. EXTREME TEMPERATURE TESTS.**

The test procedures outlined in this section verify that the test unit could withstand extreme temperature conditions that could be encountered during the life cycle of the pallet.

### **1. EXTREME COLD TEMPERATURE TESTS.**

a. The test unit will be placed into an environmental chamber and the temperature decreased to -40 degrees Fahrenheit and maintained four (4) hours. The test unit will be removed and repetitive shock tested in accordance with Paragraph B above.

b. The test unit will be returned to the environmental chamber and the temperature decreased to -40 degrees Fahrenheit and maintained four (4) hours. The test unit will be removed and Drop Tested in accordance with Paragraph A.3. and Incline-Impact Tested in accordance with Paragraph A.4.

### **2. EXTREME HOT TEMPERATURE TESTS.**

a. The test unit will be placed in an environmental chamber and the temperature increased to 135 degrees Fahrenheit and maintained four (4) hours. The test unit will be removed and Repetitive Shock Tested in accordance with Paragraph A.2.

b. The test unit will be returned to the environmental chamber and the temperature increased to 135 degrees Fahrenheit four (4) hours. The test unit will be removed and Drop Tested in accordance with Paragraph A.3 and Incline-Impact Tested in accordance with Paragraph A.4.



## **PART 4 - TEST EQUIPMENT**

### **A. COMPRESSION TESTER.**

- |                       |                      |
|-----------------------|----------------------|
| 1. Manufacturer:      | Ormond Manufacturing |
| 2. Platform:          | 60- x 60-inches      |
| 3. Compression Limit: | 50,000 pounds        |
| 4. Tension Limit:     | 50,000 pounds        |

### **B. TRANSPORTATION SIMULATOR.**

- |                  |                     |
|------------------|---------------------|
| 1. Manufacturer: | Gaynes Laboratory   |
| 2. Capacity:     | 6,000-pound payload |
| 3. Displacement: | 1/2-inch amplitude  |
| 4. Speed:        | 50 to 400 RPM       |
| 5. Platform:     | 5- x 8-foot         |

### **C. INCLINED PLANE.**

- |                  |                    |
|------------------|--------------------|
| 1. Manufacturer: | Conbur Incline     |
| 2. Type:         | Impact Tester      |
| 3. Grade:        | 10 percent incline |
| 4. Length:       | 12-foot            |

### **D. ENVIRONMENTAL CHAMBER:**

- |                  |                     |
|------------------|---------------------|
| 1. Manufacturer: | Bally International |
| 2. Model Number: | 68 X 78-4W          |

## **PART 5 - TEST RESULTS**

**5.1. TEST UNIT DATA.** The test unit was inertly loaded to the specified design weight using inert 120MM mortars. The test unit was prepared utilizing the unitization procedures specified in Part 6 – Drawings. Special care was taken to ensure that each composite monopack had the proper amount of weight in order to achieve a realistic pallet center of gravity (CG). Once properly prepared, Test Units #1 and #2 were tested using MIL-STD-1660 requirements. Test Unit #3 was cold temperature tested and Test Unit #4 was hot temperature tested.

### **TEST UNIT #1**

COMPOSITE MONOPACK FOR 120MM MORTAR,  
WITH PLASTIC PALLET ADAPTERS ON A 43" x 53" WOODEN PALLET

Test Date:	20-22 June 2005 (MIL-STD-1660)
Gross Weight:	2,140 pounds
Length:	40 inches
Width:	48 inches
Height:	34-1/2 inches
Mfgr:	Vantage Plastics, Standish, MI

### **TEST UNIT #2**

COMPOSITE MONOPACK FOR 120MM MORTAR,  
WITH PLASTIC PALLET ADAPTERS ON A 43" x 53" WOODEN PALLET

Test Date:	22-23 June 2005 (MIL-STD-1660)
Gross Weight:	2,140 pounds
Length:	40 inches
Width:	48 inches
Height:	34-1/2 inches
Mfgr:	Vantage Plastics, Standish, MI

**TEST UNIT #3**

COMPOSITE MONOPACK FOR 120MM MORTAR,  
WITH PLASTIC PALLET ADAPTERS ON A 43" x 53" WOODEN PALLET

Test Date: 27-29 June 2005 (MIL-STD-1660, COLD TEST)  
Gross Weight: 2,140 pounds  
Length: 40 inches  
Width: 48 inches  
Height: 34-1/2 inches  
Mfgr: Vantage Plastics, Standish, MI

**TEST UNIT #4**

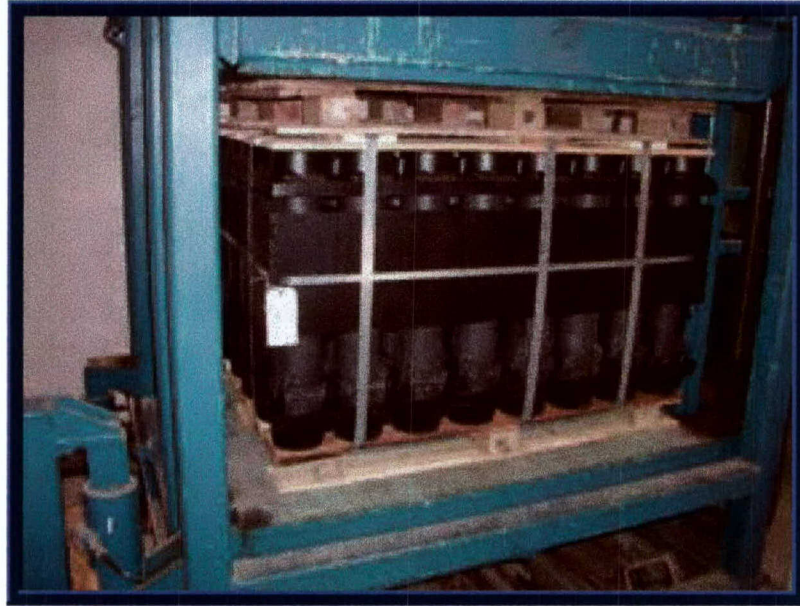
COMPOSITE MONOPACK FOR 120MM MORTAR,  
WITH PLASTIC PALLET ADAPTERS ON A 43" x 53" WOODEN PALLET

Test Date: 5-7 July 2005 (MIL-STD-1660, HOT TEST)  
Gross Weight: 2,140 pounds  
Length: 40 inches  
Width: 48 inches  
Height: 34-1/2 inches  
Mfgr: Vantage Plastics, Standish, MI



**A. MIL-STD-1660 TEST RESULTS TEST UNIT #1:**

**1. STACKING TEST.** The test unit was compressed with a load force of 10,700 pounds for 60 minutes on 20 June 2005. No damage was noted as a result of this test. See Photo 5 of the test unit in the compression unit.



**Photo 5. Test Unit #1 in the Stacking Test.**

**2. REPETITIVE SHOCK TEST.** Test unit #1 was vibrated 90 minutes at 200 RPM in the longitudinal orientation and 90 minutes at 210 RPM in the lateral orientation on 21 June 2005. No damage was noted as a result of this test. Photo 6 shows the test unit on the vibration platform.



**Photo 6. Test Unit #1 During Repetitive Shock Testing.**

**3. EDGEWISE - ROTATIONAL DROP TEST.** Test Unit #1 was edgewise-rotationally dropped from a height of 15 inches on both longitudinal sides and both lateral sides. No significant damage was noted as a result of this test, however the test unit is loose and there was significant side-to-side movement during the drop testing. Photo 7 shows the test unit during the edgewise drop test.





**Photo 7. Edgewise Drop Test on the Test Unit #1.**

**4. INCLINE-IMPACT TEST.** Test Unit #1 was impact tested on both longitudinal sides and both lateral sides. No significant damage was noted as a result of this test. See Photo 8 for the specimen during the lateral incline-impact test.



**Photo 8. Incline-Impact Testing of the Test Unit #1.**



5. **SLING COMPATIBILITY TEST.** N/A

6. **FORKLIFTING TEST.** Test Unit #1 was lifted clear of the ground by a forklift from both longitudinal sides and both lateral sides and transported on the forks. Photo 9 shows the Test Unit #1 during the Forklifting Test. No damage was noted as a result of this test.



Photo 9. Test Unit #1 During the Forklifting Test

7. **DISASSEMBLY TEST.** Inspection revealed no damage.

8. **CONCLUSION.** No major problems were encountered during the completion of the required testing. The test unit passed the requirements of the MIL-STD-1660.

**B. MIL-STD-1660 TEST RESULTS TEST UNIT#2:**

1. **STACKING TEST.** Test Unit #2 was compressed with a load force of 10,700 pounds for 60 minutes on 22 June 2005. No damage was noted as a result of this test.

2. **REPETITIVE SHOCK TEST.** The test unit was vibrated 90 minutes at 200 RPM in the longitudinal orientation and 90 minutes at 210 RPM in the lateral orientation on 23 June 2005. No damage was noted as a result of this test.

3. **EDGEWISE-ROTATIONAL DROP TEST.** The test unit was edgewise rotationally dropped from a height of 15 inches on both longitudinal sides and both lateral sides. No significant damage was noted as a result of this test; however, the test unit was loose and there was significant side-to-side movement during the drop testing.

4. **INCLINE-IMPACT TEST.** The test unit was impact tested on both longitudinal sides and both lateral sides. No significant damage was noted as a result of this test.

5. **SLING COMPATIBILITY TEST.** N/A

6. **FORKLIFTING TEST.** The test unit was lifted clear of the ground by a forklift from both longitudinal sides and both lateral sides and transported on the forks. No damage was noted as a result of this test.

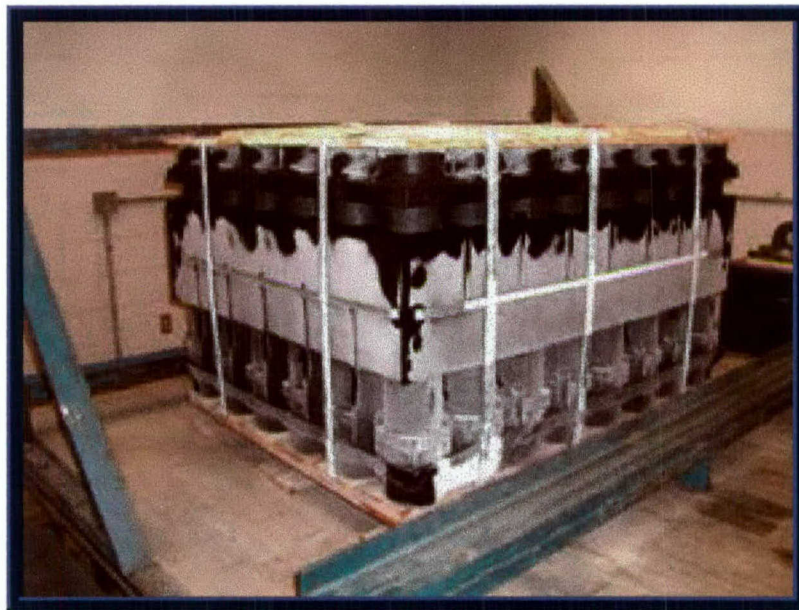
7. **DISASSEMBLY TEST.** Inspection revealed no damage

8. **CONCLUSION.** No major problems were encountered during the completion of the required testing. The test unit passed the requirements of the MIL-STD-1660.

**C. EXTREME COLD TEMPERATURE MIL-STD-1660 TEST RESULTS TEST**  
**UNIT #3:**

**1. STACKING TEST.** N/A

**2. REPETITIVE SHOCK TEST.** Test Unit #3 was vibrated 90 minutes at 200 RPM in the longitudinal orientation and 90 minutes at 210 RPM in the lateral orientation on 27 June 2005. No damage was noted as a result of this test. Photo 10 shows the test unit on the vibration platform.



**Photo 10. Test Unit #3 During Repetitive Shock Testing.**

**3. EDGEWISE-ROTATIONAL DROP TEST.** Test Unit #3 was removed from the environmental chamber and edgewise- rotationally dropped from a height of 15 inches on both longitudinal sides and both lateral sides. One steel banding strap broke during the first drop but testing was continued because it was determined the test unit could have continued safely during transit. No other



significant damage was noted as a result of this test; however, as stated in the ambient tests, the test unit was loose and significant side-to-side movement during the drop testing. Photo 11 shows the test unit during the edgewise drop test.



**Photo 11. Edgewise Drop Test on the Test Unit.**

**4. INCLINE-IMPACT TEST.** The test unit was impact tested on both longitudinal sides and both lateral sides. No significant damage was noted as a result of this test. See Photo 12 for the specimen during the lateral incline-impact test.



Photo 12. Incline-Impact Testing of the Test Unit.

5. SLING COMPATIBILITY TEST. N/A

6. FORKLIFTING TEST. N/A

7. DISASSEMBLY TEST. Inspection revealed no damage.

8. CONCLUSION. No major problems were encountered during the completion of the required testing. The test unit passed the requirements of the MIL-STD-1660 during extreme cold temperatures.

**D. EXTREME HOT TEMPERATURE MIL-STD-1660 TEST RESULTS TEST UNIT #4:**

1. STACKING TEST. N/A

2. REPETITIVE SHOCK TEST. Test Unit #4 was removed from the chamber and vibrated 90 minutes at 200 RPM in the longitudinal orientation and

90 minutes at 210 RPM in the lateral orientation on 27 June 2005. No damage was noted as a result of this test.

3. **EDGEWISE-ROTATIONAL DROP TEST**. The test unit was removed from the chamber and edgewise-rotationally dropped from a height of 15 inches on both longitudinal sides and both lateral sides. No significant damage was noted as a result of this test; however, the test unit was loose and there was significant side-to-side movement during the drop testing.

4. **INCLINE-IMPACT TEST**. The test unit was impact tested on both longitudinal sides and both lateral sides. No significant damage was noted as a result of this test.

5. **SLING COMPATIBILITY TEST**. N/A

6. **FORKLIFTING TEST**. N/A

7. **DISASSEMBLY TEST**. Inspection revealed no damage.

8. **CONCLUSION**. No major problems were encountered during the completion of the required testing. The test unit passed the requirements of the MIL-STD-1660 during extreme hot temperatures.



## **PART 6 – DRAWINGS**

The following drawing represents the load configuration that was subjected to the test criteria.

## APPENDIX ##

# UNITIZATION PROCEDURES FOR COMPLETE ROUNDS PACKED IN CYLINDRICAL METAL OR PLASTIC CONTAINERS ON 4-WAY ENTRY PALLETS

MORTAR, 120MM, PACKED ONE PER  
COMPOSITE MONOPACK, UNITIZED 48  
MONOPACKS PER 42" X 53" PALLET;  
APPROX BOX SIZE 5-1/2" L X 5-1/2" W  
X 29-15/16" H

**NOTICE:** THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH  
THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4079-20PM1002.

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AMSFS-ST		ENGINEER OR TECHNICIAN	BASIC REV.	MICHAEL BARTOSIAK				
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND		TRANSPORTATION ENGINEERING DIVISION						
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		ENGINEERING DIRECTORATE			19	48	4079/ XX	20PM1002

PROJECT FSA 63/XX-66

PALLET UNIT DATA				
ITEMS INCLUDED		HAZARD CLASS AND DIVISION	COMPAT-IBILITY GROUP	APPROX WEIGHT LBS
NSN	DODIC			
1315-UNASSIGNED	XXX	1. 1	E	2, 123

• INTERIM HAZARD CLASSIFICATION DATA CONTAINED IN THE ABOVE CHART IS FOR GUIDANCE AND INFORMATIONAL PURPOSES ONLY. VERIFICATION OF THE SPECIFIED DATA SHOULD BE MADE BY CONSULTING THE MOST RECENT JOINT HAZARD CLASSIFICATION SYSTEM LISTING OR OTHER APPROVED LISTING(S).

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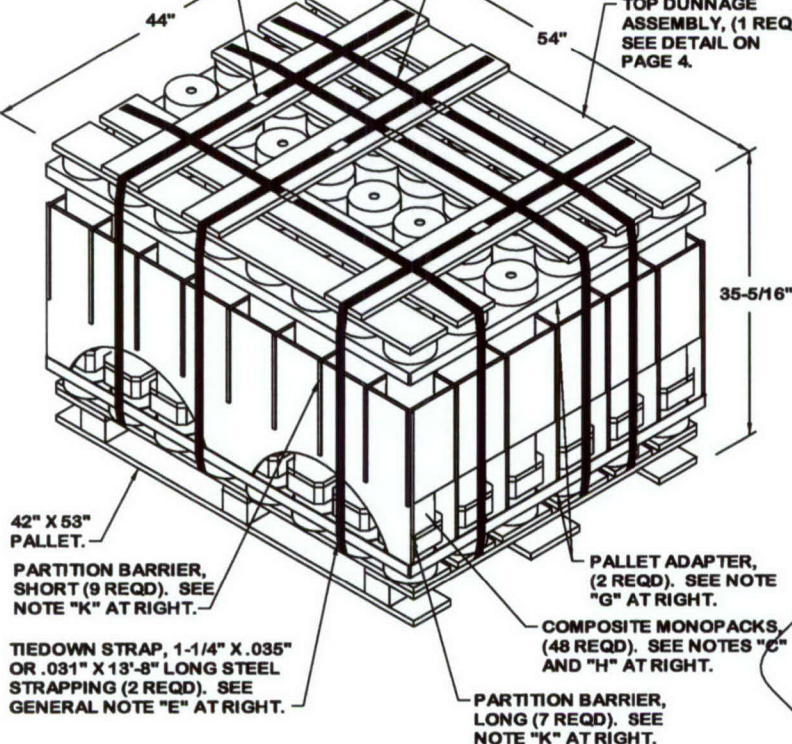
SEAL FOR 1-1/4" STRAPPING  
(4 REQD, 1 PER STRAP).  
CRIMP EACH SEAL WITH  
TWO PAIR OF NOTCHES.

LOAD STRAP, 1-1/4" X  
.035" OR .031" X 13'-8"  
LONG STEEL STRAPPING  
(2 REQD). SEE GENERAL  
NOTE "D" AT RIGHT.

TOP DUNNAGE  
ASSEMBLY, (1 REQD).  
SEE DETAIL ON  
PAGE 4.

## GENERAL NOTES

- THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4079-20PM1002. TO PRODUCE AN APPROVED UNIT LOAD, ALL PERTINENT PROCEDURES, SPECIFICATIONS AND CRITERIA SET FORTH WITHIN THE BASIC DRAWING WILL APPLY TO THE PROCEDURES DELINEATED IN THIS APPENDIX. ANY EXCEPTIONS TO THE BASIC PROCEDURES ARE SPECIFIED IN THIS APPENDIX.
- DIMENSIONS, CUBE AND WEIGHT OF A PALLET UNIT WILL VARY SLIGHTLY DEPENDING UPON THE ACTUAL DIMENSIONS OF THE BOXES AND THE WEIGHT OF THE SPECIFIC ITEM BEING UNITIZED.
- NOTE: MONOPACK COMPOSITE CONTAINERS IN THE UNIT LOAD DEPICTED ARE ORIENTED WITH THE TOP LID OF THE CONTAINER FACING INTO THE BOTTOM ADAPTER.
- THE LOAD STRAPS MUST BE REPOSITIONED ON THE TOP DECK BOARDS OF THE PALLET PRIOR TO PLACING THE BOXES ON THE PALLET. LOAD STRAPS MUST BE TENSIONED AND SEALED PRIOR TO APPLICATION OF THE DOWN STRAPS.
- INSTALL EACH TIEDOWN STRAP TO PASS UNDER THE DECK/STRINGER BOARDS OF THE PALLET AND TO BE LOCATED AS SHOWN. TIEDOWN STRAPS WILL NOT BE APPLIED UNTIL THE LOAD STRAPS HAVE BEEN TENSIONED AND SEALED.
- IF ITEMS COVERED HEREIN ARE UNITIZED PRIOR TO ISSUANCE OF THIS APPENDIX, THE CONTAINERS NEED NOT BE REUNITIZED SOLELY TO CONFORM TO THIS APPENDIX.
- FOR DETAILS OF THE PALLET ADAPTERS, SEE ARDEC DRAWING 13005764.
- EMPTY OR REJECT MONOPACK CONTAINERS WILL BE USED AS FILLER CONTAINERS AS NECESSARY. FILLER CONTAINERS MUST BE INSTALLED IN THE MIDDLE OF AN OUTSIDE ROW(S) OF CONTAINERS. WHEN (EMPTY/REJECTED) FILLER CONTAINERS ARE USED IN PLACE OF OMITTED CONTAINERS TO COMPLETE A LAYER ON A PALLET, THEY WILL BE MARKED AS SPECIFIED IN DAC DRAWING ACV00561. FOR DETAILS OF THE MONOPACK CONTAINER, SEE ARDEC DRAWING 13005750.
- THE STYLE 1B PALLET DELINEATED IN THE DETAIL AT LEFT NEED NOT HAVE CHAMFERS AS SPECIFIED WITHIN MILITARY SPECIFICATION MIL-P-15011 WHEN USED FOR THE UNITIZATION OF ITEMS COVERED BY THIS APPENDIX.
- FOR DETAILS OF THE PARTITION BARRIERS, INSENSITIVE MUNITIONS FOR 120MM MORTAR AMMUNITION, SEE ADREC DRAWING 13005765.



## PALLET UNIT

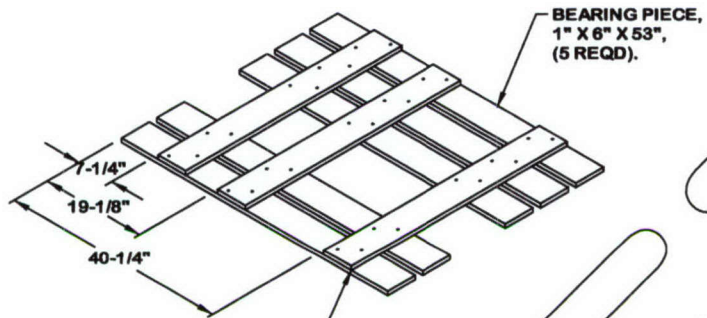
SEE GENERAL NOTE "B" AT RIGHT.

48 MONPACKS OF 120MM MORTARS AT 39 LBS EACH - - - - 1,872 LBS (APPROX)  
DUNNAGE - - - - - 239 LBS  
PALLET - - - - - 90 LBS

TOTAL WEIGHT - - - - - 2,201 LBS (APPROX)  
CUBE - - - - - 50.4 CU FT (APPROX)

## BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	33	17
NAILS	NO. REQD	POUNDS
PALLET, (42" X 53"	1 REQD	90 LBS
STEEL STRAPPING, 1-1/4"	58 REQD	8.79 LBS
SEAL FOR 1-1/4" STRAPPING	4 REQD	NIL
SHORT IM BARRIER	16 REQD	80 LBS
LONG IM BARRIER	12 REQD	70 LBS
PALLET ADAPTER	2 REQD	46 LBS



BEARING PIECE,  
1" X 6" X 53",  
(5 REQD).

TIE PIECE, 1" X 6" X 43"  
(3 REQD). NAIL TO  
BEARING PIECE W/2-4d  
AT EACH JOINT

TOP DUNNAGE ASSEMBLY DETAIL

1 REQD.